

Sustaining Science through Language in a Pluralistic World

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Received: March 12, 2015 Accepted: April 27, 2015 Online Published: June 29, 2015

doi:10.5539/elt.v8n7p62 URL: <http://dx.doi.org/10.5539/elt.v8n7p62>

Abstract

In any society, the role of language has always been a very vital and incontrovertible one. The bible made us to understand that at the beginning, there was word and the word was with God and God was the word. The world and all that we have therein were created through word. This makes one to wonder about the power in language today. At all levels in life, we make use of language to perform one operation or the other. At the level of education, there is no doubt that language is the tool that we use not minding the area of one's study. This is why we can boldly say that language is the vehicle through which whatever we do in the world can forge ahead. With all these as our launching pad, this paper looks into the necessity and the intermingling of science and language. It examines some areas of complementarities in the two fields where effective teaching, learning, comprehension and positive application can effectively take place. Since science is the in-thing in the present world, it then becomes imperative that language will continue to sustain and promote the growth of science in the present global setting.

Keywords: language, science, concept, terms, experiment, linguistics

1. Introduction

The fact cannot be contested that in any society, there is the need for effective interaction as well as communication if such a society is to have a smooth running environment. In fact, effective interaction and communication are the unavoidable pivots for the running of a meaningful society. However, effective interaction comes as a result of functional communication be it oral or written. This is very necessary in both formal and informal settings since language is used to pilot the affairs of whatever will happen in any environment. This is why in anything we do, language is always the anchorman that ensures everything goes on smoothly (Bloomfield, 1933; Widdowson, 1968). In the modern world where science and technology are playing the frontal role, language is always the instrument that cannot be avoided since everything is done through the use of language; and that is why it has become necessary for anyone to be competent in the language (Halliday 2013). A scientist or a technologist who is not competent in English will definitely collapse. For the proper sustenance of today's science and technology, it then becomes expedient to ensure a proper marriage between the two disciplines; more so when the language is the only instrument of formal communication and medium of instruction.

2. Language and Science

It will be difficult to separate language from science. The two are interrelated and they have been defined in different ways. This is because in a human society, we see things in different ways and that is why series of definitions have been proffered for language. In the same vein, science also has been given different definitions. Using a descriptive analogy of various ways in which science has been seen, it can be perceived as the knowledge that has to do with series of facts that have to do with the world in which we live. Also, science can be observed to deal with a systematic inquiry that has to do with a particular subject matter. In another pedestal, we can look at science as an activity that can be carried out by a scientist with a view to finding out more about the environment in which we live. Science could therefore be seen as a form of knowledge that deals with nature and how it relates with other things in the environment. Viewed from another perspective, science could also be described as a collection of facts that are needed in order to provide a set of knowledge that is straight forward, exact and devoid of ambiguity. The type of knowledge that is scientifically produced is empirical which erases any doubt whatsoever. Based on the veracity of facts that have been scientifically proved, science therefore has

to do with the establishment of certain rules or laws that can be used to substantiate different facts or ideas that are grounded in the human experience in this world (Hogben, 1969; Darbyshire, 1971). We can go on and on to give different types of definitions/descriptions of what we now know as science; it depends on the way we see or view it. No matter what definition or description given to science, the fact still remain incontestable that language is the tool that is needed to propel science into the required pedestal in our society.

There is no doubt that human beings have been specially created in such a way that they can use their knowledge and experience to discover things around them. The powerful tool that is always in use to carry out such a task is language. Language can therefore be viewed as something that has to do with feeling, thinking, ideas and how they can be manipulated with the available linguistic codes. Experience is therefore needed to enrich and define the different concepts and ideas that will in turn be needed to enrich and guide our new experience. Language is used to construct and to shape the world according to our knowledge and conceptual frame of the environment in which we live. In the present world, it is a fact that there are different concepts, different ideas as well realities that we need to combat with. We therefore need language and its logic as the available tools which can be used to interact with the concepts, ideas and realities in the world. It could be observed that human languages have what we can refer to as the empirical reference and as a result of the empirical reference, statement can be made that will involve feelings, ideas which are tested by comparing them with what might have been observed earlier. However, there is the need to be cautious because what we refer to as 'real' or 'reality', as the case may be, can have different linguistic connotations. Just as the scientific language is usually associated with empirical facts, ordinary language can also be empirical even though the quality and degree may not be the same.

Language can therefore be seen from different angles and perspectives thereby leading to various definitions to explain or describe the concept. In whatever way it is defined or explained, the central focus is the centrality of language which serves as its anchorman. Language and Science are veritable tools in any human endeavor and without the two, one wonders what the society will look like. In the present world where science has taken a frontline position, it will be awkward to live without some elements of science. However, whatever element one wants to acquire, language is the tool that will be used to rightly propagate it into our thinking process and understanding. That is why it becomes imperative to have the reasonable degree of competence in both science and language. In a multilingual nation like Nigeria, the multiplicity of our local languages has always been the problem and this has led to the birth of a neutral language—English which has now occupied a major role in our existence. Apart from others, it is the language of instruction in our schools. The importance has gained a first class degree of relevance now because for anyone to progress in his/her education, he/she must possess a credit pass in English as well as Mathematics. This is why language and science have become forces to reckon with. In our tertiary institutions as well, special elective courses are mounted in English and Science for students in the appropriate disciplines so as to ensure that the relevant knowledge is acquired by the students. All these have shown the needs for these subjects (Webster, 2015).

3. The Role of Language in Science

It is the intention of this paper to look into the crucial role that language is playing in the interaction with, as well as the sustenance of science in various forms. There could be some groups of people without the required understanding and knowledge about language generally; such will have the feeling that language has no active role to play in science. They are of the opinion that language is simply meant to pass information among different interlocutors. They are also of the belief that any attempt to express a new scientific idea is just like one is only attempting to be linguistically more creative or trying to enrich one's word bank. The thinking of this nature is a very myopic one and it does not give a wider perspective to the present roles of language in the present world.

The role of language is not just a passive one. In the area of physics as a discipline, for example, there is the need to place side-by-side the modern theory of information and language. This is because this theory has to do with bits and pieces of information that will have to pass to the receiver through the transmitting channel. In this connection, there has been the entrance of a related notion i.e. the concept of 'signal'. This concept can be linked with the Special Theory of Relativity. In comparison with Einstein, Bohm (1971) noted that in one of Einstein's studies, there is an area where his conception of signal is at variance with the corresponding "quantum" in science. This is because, to Bohm, there might be a time when "a certain kind of analysis" will not be "compatible with the sort of undivided wholeness that is implied by the quantum theory". Since language is the tool that is used to transport concepts, ideas and other, the writings of Bohr and Bohm have shown that the role of language in science is very germane because it does not just transport information; it also contextualizes and codifies the information with a view to giving a clearer meaning to the subject in question. A scientist who is

well versed in the lexicon will find it useful to select the more appropriate lexical item that can be used in a particular context.

Apart from the day-to-day normal use of language, the use of language in drawing and painting is another very important area. Artists believe that their works carry a lot of meanings through visual imagination. In this context, information is conveyed to the brain and the meaning is attached accordingly. This is mainly impressionistic when compared with science where the language is clearly seen, read and analyzed.

From this, it can be argued that there are good degrees of similarities in the ways we visualize the world and the way in which we finally elicit a mental construct of our society and environment. Actually, language is seen as playing active roles in science by creating the needed environment for the dissemination of the appropriate information, by providing the necessary linguistic wherewithal that will help in giving the needed scientific facts and details that will help in the propagation of new ideas and in developing the existing ones.

For the growth and development of science in the present world, language must also be carried along since whatever we do at all will be channeled through language. Science is very important in the society and without it; one wonders what the society will look like. A good number of scientists with a flair for language study will make us to understand that their interest in linguistic knowledge has led to their improvement in science and that it has made things easier for them in serving the generality of the people they interact with. There have been a good number of scientists who have produced excellent literary materials. Such people are very much aware of the role of language and science, they have already enjoyed the practical reality of language in action when interacting with friends, and colleagues and they have been very much aware of the functionality of language in science and, of course, the role of science in language.

4. Language and Meaning

Meaning is an essential factor in language and when we make an utterance, there are bound to be the intended meaning(s) which, of course, will give room for the feedback. The use of language (either indigenous or foreign) has implications for the understanding of the subject being taught. In Nigeria, some years back, the then University of Ife, Ile-Ife (now Obafemi Awolowo University) carried out a research on language and the understanding of what is being taught (Fafunwa, 1982). The study showed that the child indigenous language will give a clearer and better understanding of the subject taught rather than English as a second language. The research was carried out in a period of six years (from primary one to primary six). In the study, there was the controlled group as well as experimental group and each term, the result would reveal that the students that were being taught in the indigenous language performed far better. This is because the meaning of all the lexical terms being used would easily sink into their memory. In terms of the language use, the experimental group is always in the better position since the meaning or its associated theories would not constitute any problem for them. This has shown that meaning is a very delicate issue which must be taken with all seriousness.

So as to sustain the teaching of science, there is therefore the need to be well-versed in the language in use. There is the need to be able to distinguish between the series of meanings of different lexical items being used. Register items must be seriously taken into consideration and the meanings must also be critically looked into more so that science and all its disciplines are register items.

Meanings can change at different times and contexts. For example, in a situation where there have been changes in meanings of words, there would have been some causative factors that could be historical, social, and economic which might have orchestrated the change. In science, changes of such must have had some far-reaching effects in the society and this must have led to changes in the thinking process and meaning during the time of Aristotle up to the era of Newton. For example, the lexical item "space" can be differently interpreted. The term can be used in different contexts by different scientists and when this is done, the meanings will definitely be different since a single lexical item can have more than one meaning. Also, scientists in the area of physics will not be at a loss when we talk of differences among the quantum theory, relativity and the mechanics of Newton. However, there could be some words with differences in meaning and the differences might be so minute or subtle such that the two meanings can co-exist or rather be used interchangeably. This implies that different words with little differences in meaning might, at times, be employed within the same context if adequate linguistic care is not taken. In our verbal or written communication therefore, it is imperative to take cognizance of the choice of words so as to know the use of the right word at the right time. For clearer understanding of what language is, we can look at it from the following levels:

- a) A lexicon—This is a technical term which has to do with all the words and phrases used for linguistic intercommunication between or among groups.

b) A grammar—This has to do with the rules by which words change their forms and are combined into sentences; the ruler are to guide the association of words that can be used in intercommunication.

There is the need to study the use and organization of language bearing in mind the particular linguistic theories and when this is done, we have the knowledge of linguistics. In language or linguistics, grammar can be viewed as containing the following components: a lexicon, a morphology, a syntax, a phonology, a semantics and, of course, a text compiler. Lexicon and grammar had been highlighted above; morphology has to do with the studies of morphemes of a language and the way in which they are joined together to make words. a syntax is a way of constructing sentences and phrases; a phonology deals with the system of speech sound or ways of articulating words individually or in a larger discourse. Semantics deals with the meanings of words or sentences. The words, phrases and sentences constructed can then be compiled into a larger discourse. All these are important if correct meanings are to be attached to our language use (Bohn, 1971, 1987; Gibson & Collings, 2011).

When words and phrases are compiled into a larger discourse, the meanings must flow effectively if the text is to deliver its message correctly. Following the work of Odgen and Richards (1966), Wittgenstein (1968) has also dealt with the ideas of meaning in linguistic studies. Wittgenstein has laid much emphasis on the context in which language is used rather than the dictionary meanings of words. By this we mean that language use, together with all its contextual variables, will be the determining factors for the true meaning of the discourse.

5. Scientific Methods

At this point, it is logical to look briefly into some of the methods of science in dealing with some vital scientific actions and how such methods can be linked with language. The normal thing in science is to come up with the designing of series of hypotheses, conducting various experiments, bringing out series of argumentation which can be positively proved or otherwise. This will eventually lead to the report of the findings based on the experiment carried out. In an exercise of this nature, language is actively involved so as to give necessary information to readers and observers. However, the kinds of lexical items and sentences to be used may differ depending on the activity that is being carried out. No doubt, language use will differ based on the result of the findings or the necessity to use more symbols than language vocabulary and sentence types and patterns. Even at that, such vocabulary items and the types of sentence that are used must be such that will have the necessary links with the subject on ground and it must take cognizance of the surrounding contextual variables (Jakobson, 1973; Maciej, 2015).

It has to be noted that the emergence of science can be traced to the history of man's existence. Many scientific methods had been proposed, experimented or discarded; some are ultimately to be revived in subsequent periods (Gilman, 1961). There are the inductive and deductive methods of reasoning and because of the popular place of the deductive approach to reasoning then; deductive method was considered the universal method of knowledge acquisition. Then, the idea of practical investigation and verification were therefore relegated. Scientists are expected to follow the needed scientific methods in their subjects coupled with the carrying out of the necessary research activities. The formation of different types of theories, working on different hypotheses propounded, posing theoretical problem, working on the validity and proof of different propositions are parts of what the scientists have to follow in their scientific efforts. Scientists have to establish their own fundamental ways of reaching of reaching verifiable conclusion and those who share in such ways of operation have to fall in line with them as far as their use of productive language is concerned (Dass, 1974). On one perspective, it might be viewed that the method of science which has to do with some degree of reliability is needed to arrive at truth but the fact is that truth itself is difficult to define. For a scientist, truth is empirical in content, rational in nature, verifiable and, of course, is a public event. Just as the scientific theory takes the premise-conclusion form; the sentences, sentence patterns and the lexical items used must be of a type that will present assertion in factual statements. There must also be the use of conditional clauses that will state conditions for deductions, the use of descriptive statements for descriptions and of course, it must be ordered in such a way that the previous sentence flows smoothly into the next such that the succeeding will take its cue from the preceding one. Empirical verification must be couched in terms which present the adequate description of occurrences as well as repeating comparative occurrences of events (Gilman, 1961; Hogben, 1969; Ogunsiji & Ojo, 2012).

Scientific methods of inquiry is said to have originated from the situation where man is faced with some critical problems which have to be attended to with some solutions. The solutions have to go through several processes or steps and some of the major stages. Hilton (1971) has observed these processes and they have been complimented and paraphrased as follows: a) breaking up the existing problem into its parts, b) collecting the available facts that are relevant, c) clarifying the available facts through observation and experiment, d)

proposing hypotheses that would help to resolve the existing problems, e) working out of the implications for the predictions earlier made, f) carrying out of tests upon the earlier predictions, and g) making the conclusion or stating the findings.

The lexical items that are used when attending to the prevailing problems may not produce what we can call critical precision at that point. This is because the perception then may not go beyond the surface structure and this may not be able to produce the underlying truth or reality that will be needed. In stating the underlying truth in some experiments, some language forms showing some degree of abstraction as well as that of mathematical form are used so as to produce some degree of mathematical precision. Hence, in scientific method, there is the need, at times, to have a change of expression from being basically descriptive or classificatory in language use to a more precise and mathematical one. In the expression of scientific facts and observation, the language used must be such that will apply to the public in comprehension; it must be clear, logical, coherent, relevant and devoid of ambiguities.

6. Types of Scientific Language

The terms science and technology may be somewhat synonymous to a layman because one might tend to look at both terms from the same perspective. The two terms are closely related but the fact is that science is basically a search for new knowledge, while technology is trying to apply what science has searched for in various ways. By this we are inferring that technology is the applied form of what sciences have quested for. No doubt, a set of knowledge is usually brought out through the application of science and such new sets of knowledge will be of help in contributing to the enrichment or refinement of knowledge that science has provided given. It is a known fact that technology has been having great positive impacts on the life of human beings and these impacts have been having tremendous effects on man. From another perspective, it is equally important to always see science, technology and language as very complementary and it will not be wrong to say that technology has played very active roles in trying to maintain the sustainability of science and language just as language and science have also continue to keep on the growth of technology (Gilman, 1961; Hilton, 1971).

In science as well as other related disciplines, there is usually a common classification of the types of language used. We can talk of technical language, workshop language, consumer language and so forth. In science, for instance, a technical variety of language is being used while the workshop language variety, which is also a technical variety, is used in technological level. The consumer language which is another variety is generally meant for the non-scientists. At this point, we talk of register language and this is not limited to science and technology; it cuts across different professions. That is why we can talk of language of law, language of advertisement, language of medicine and a whole lot of others. A technical variety of language is usually indicated by the choice of lexical items that are directly related to its field just like other varieties. The language of the workshop has the variety that seems very close to the ordinary language and it is often seen as a variety that is hanging between the scientific and the consumer's variety. This is because the workshop language seems to borrow from other dialectal choices while the technical variety can be identified by its formal, occupational and lexical choices. The variety of the consumer language is identifiable through the combination of informal, persuasive and ordinary normal day-to-day language use. While language of workshop makes use of the choice of words that will illustrate things in concrete term, language of science usually takes as the focus, the conceptual framework that is characteristic of science. Also, the language of workshop seems to have more figurative expressions in its use so as to add flavor to the use of the variety. This is basically to create the needed familiarity and the necessary rapport between or among the interactants (Savory, 1967; Widdowson, 1968; Hilton, 1971; Maciej, 2015).

7. Conclusion

From all we have touched in this paper, it is clear that we have seen the relationship between language and science. In any association, society or community where we have human beings, the use of language becomes a necessity. Every subject or discipline has its own variety of language and science is not an exception. The language of science has its own characteristics which are basically the accuracy in terms of description, drawing of hypotheses, experimentation and drawing of final conclusion. The language is properly structured and codified so as to provide the needed contextual meaning needed such that if some new or foreign lexical items are used in science, there is always the tendency to ensure that their meanings are definitely delimited so as to ensure the accuracy that is needed. This helps in ensuring the objectivity that is characteristic of science.

According to Havrinek (1932), language is not used anyhow in science; it must be directed towards a goal with a view towards having a generally accessible and meaningful communication. Moreover, the variety of language that is science-specific focuses on achieving a maximum positive parallelism between the linguistic expression

which serves as a veritable vehicle and the gradual but steady and systematic development of science in every ramification. It then becomes incumbent on all scientists as well as all who have interest in the discipline to always be language-conscious since it is the only tool that will put us on the sound pedestal in the achievement of our developmental objectives in the present world

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